# SPLENECTOMY.

REPORT OF SIX CASES, TOGETHER WITH A STATISTICAL SUMMARY OF ALL THE REPORTED OPERATIONS UP TO THE YEAR 1908.*

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SPLENECTOMY, or the operation of removal of the spleen, may be indicated either because of pathological changes or injuries and wounds affecting that organ.

The physiology of the spleen presents many difficult problems for solution, but the classic experiments of Bardeleben, in 1841, showed that the spleen might be removed in healthy animals and be followed by no serious loss to the animal economy. The knowledge of this fact soon led to the performance of this operation in the case of human beings who presented evidence of disease or injury of the spleen.

The close relationship existing between the spleen and the blood-forming organs would lead one to suppose that its extirpation would be followed by pronounced alterations in the blood and lymphatic glands. It has been found that slight changes do occur but of an apparently insignificant character. Vulpius, who first made this feature the subject of experimental study, concludes as follows:

1. Extirpation of the spleen produces a transitory decrease in the number of red, and an increase in the number of white, corpuscles.

2. The thyroid gland cannot vicariously assume the function of the spleen.

3. The lymphatic glands and the bone marrow show an increased blood-forming activity after removal of the spleen.

4. The regeneration of the blood, after loss of blood, is

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probably less rapid in individuals in whom splenectomy has been performed.

It has been observed that some patients complain of pain in the bones after operation which has been attributed to increased medullary activity. In some few cases the thyroid gland has apparently hypertrophied, associated with symptoms of increased thyroid function. It has been suggested,—and experimental work to some extent corroborates this,—that an animal deprived of its spleen becomes more liable to infection by any pyogenic bacteria.

Extirpation of the spleen in human beings has been done for various conditions by a number of operators and we may conclude that splenectomy is a justifiable operation in certain cases. The operation, however, is a serious one and is attended with a high mortality. The chief inherent dangers are hemorrhage and shock, but there are many additional factors which have to be considered, such as the size of the tumor, the presence of adhesions, and other concomitant conditions. A correct knowledge of the disease process is most essential, and this has to do particularly with the question whether the lesion in the spleen is a primary affection, or a part of a more generalized process.

In order to speak with some degree of understanding on these points I have summarized the contents of an exhaustive monograph by Bessel-Hagen, in which all the recorded cases of splenectomy prior to 1900 are tabulated, and to these I have added an analysis of all the subsequent operations to the first of January, 1908. In this way I have collected in all 708 cases of splenectomy, including six cases of my own. The mortality in the whole series is 27.4 per cent., while that of the 8 years from 1900 to 1907, inclusive, is 18.5 per cent. The exact value to be placed on a statistical inquiry of the kind I have undertaken is difficult to estimate. The most noticeable thing is that a very large proportion of these 708 cases are reports of single cases by different operators. This fact has a bearing in two directions: in the first place it may be supposed that only successful cases are reported, while on

the other hand one's skill in performing an operation is largely dependent upon one's experience with it. With these appreciations of the possible fallacy in the deductions I will proceed to discuss the different lesions of the spleen that may, or may not, be treated by splenectomy, and the results of the operation up to the present time.

Bessel-Hagen,[20] in 1900, compiled 360 cases of splenectomy, exclusive of cases of partial splenectomy. Of these, 222 cases recovered and 138 were fatal, a mortality of 38.3 per cent. In his tabulation, however, he includes only 335 cases with 212 recoveries and 123 deaths, as he chose to omit certain cases in which he believes the value of splenectomy was biased by co-existing conditions. In the accompanying table I have attempted to include all the recorded operations of splenectomy up to January 1, 1908, but have been able to find only 353 cases reported prior to 1900.

*Idiopathic Hypertrophy of the Spleen.*—Chronic tumor of the spleen, in certain instances, may be justly attributed to one of several causes, to be found either in a primary condition of the spleen, or as a part of a constitutional dyscrasia. Quite apart from these factors, however, not a few cases of chronic splenic enlargement exist in which the clinical history and all the concomitant conditions throw absolutely no light on the origin of the tumor. Nor are the pathologists prepared to classify these enlarged spleens except under the general term of chronic indurative splenitis. It seems most probable, however, that the inception of the process is to be sought in some past infectious disease. Not a few cases are undoubtedly due to a latent malarial infection, as splenomegaly is very common in individuals who reside in or emigrate to malarial regions, who give no history of chills and fever. Other possible causes are to be sought in chronic infectious diseases, such as congenital and acquired syphilis, rickets, scrofulosis, scurvy, etc., and as a sequel to acute hyperplastic splenitis from various causes. Is it not possible that some general infections may occur in which the spleen may bear the brunt of the attack without other general manifestations? One well recognized

| Disease or Lesion. | Bessel-Hagen to 1900. | | | Johnston, 1900–1908. | | | Total to 1908. | | |
|---|---|---|---|---|---|---|---|---|---|
| | Cases. | Recovered. | Died. | Cases. | Recovered. | Died. | Cases. | Recovered. | Died. |
| Idiopathic hypertrophy | 33 | 20 | 13 | 41 | 33 | 8 | 74 | 53 | 21 |
| Idiopathic hypertrophy, ectopic spleen | 45 | 40 | 5 | 15 | 14 | 1 | 60 | 54 | 6 |
| Idiopathic hypertrophy, twisted pedicle | 16 | 8 | 8 | 11 | 11 | 0 | 27 | 19 | 8 |
| Malarial hypertrophy | 88 | 58 | 30 | 61 | 53 | 8 | 149 | 111 | 38 |
| Malarial hypertrophy, ectopic spleen | 26 | 25 | 1 | 14 | 14 | 0 | 40 | 39 | 1 |
| Malarial hypertrophy, twisted pedicle | 5 | 3 | 2 | 7 | 7 | 0 | 12 | 10 | 2 |
| Splenic anæmia | 17 | 12 | 5 | 44 | 37 | 7 | 61 | 49 | 12 |
| Cysts, hydatid | 15 | 11 | 4 | 8 | 8 | 0 | 23 | 19 | 4 |
| Cysts, non-parasitic | 7 | 7 | 0 | 12 | 12 | 0 | 19 | 19 | 0 |
| Leukæmia | 42 | 4 | 38 | 7 | 2 | 5 | 49 | 6 | 43 |
| Tuberculosis of spleen | 4 | 3 | 1 | 6 | 5 | 1 | 10 | 8 | 2 |
| Sarcoma of spleen | 9 | 6 | 3 | 3 | 3 | 0 | 12 | 9 | 3 |
| Abscess of spleen | 7 | 7 | 0 | 2 | 1 | 1 | 9 | 8 | 1 |
| Miscellaneous affections | 2 | 1 | 1 | 11 | 10 | 1 | 13 | 11 | 2 |
| Wounds and injuries | 37 | 20 | 17 | 113 | 79 | 34 | 150 | 99 | 51 |
| Totals | 353 | 225 | 128 | 355 | 289 | 66 | 708 | 514 | 194 |
| Per cent | | 63.7 | 36.3 | | 81.5 | 18.5 | | 72.6 | 27.4 |

cause is found in all conditions of congestion or stasis, such as an obliterative phlebitis of the splenic vein, and particularly chronic occlusion of the portal vein with associated cirrhosis of the liver.

The indications for the removal of the idiopathically enlarged spleen are not at all absolute. It is principally justified as a prophylactic measure, as an otherwise trivial traumatism may seriously jeopardize the patient's life by the susceptibility of the enlarged spleen to rupture. The mortality depends directly upon two factors: the size of the spleen, and the skill and experience of the operator.

Prior to 1890 splenectomy was performed for idiopathic hypertrophy 18 times with 7 recoveries and 11 deaths; from 1890 to 1900, 15 cases were treated by splenectomy with 13 recoveries and 2 deaths; from 1900 to 1908 I have collected 41 splenectomies with 33 recoveries and 8 deaths (see bibliography). This gives a total of 74 splenectomies with a mortality of 28.3 per cent.

*Ectopic Spleen with Idiopathic Hypertrophy.*—By far the most common cause of displaced, or wandering, spleen is an enlargement of that organ which induces a relaxation of its suspensory apparatus. In rare instances an ectopic spleen may be a congenital anomaly, as in a case cited by Moynihan in which a boy twelve years old had a spleen so mobile that it would lie in the left iliac fossa. The only other condition in which a spleen of normal size is found displaced is in connection with a general visceroptosis, as in Glenard's disease.

The indications for splenectomy in cases of ectopic hypertrophied spleen are usually definite. A patient with a large floating spleen is always in jeopardy from the possible occurrence of torsion of the pedicle. In not a few cases distinct subjective symptoms are found to be due to a displaced spleen, as it may exert pressure on, or become attached to, various organs in the abdominal cavity. A rather frequent situation is in the pelvis, where it may become adherent to the uterus, as in one of my cases, so as to simulate a subserous fibroid.

In some cases intestinal obstruction has been caused by the pressure of a wandering spleen.

The statistics of splenectomy for ectopic hypertrophied spleen show 17 operations prior to 1890 with 14 recoveries and 3 deaths; from 1890 to 1900, 28 splenectomies were done with 26 recoveries and 2 deaths. Since 1900 I have been able to find reports of only 14 cases with 13 recoveries and 1 death, as follows: Bland-Sutton [27]; Bryson [39]; Haeckel [96]; Lucy [149]; Schon [217]; K. Schwarz [218]; Silvestri [223]; Ashby,[9] large ectopic spleen complicated by typhoid fever; Llobet,[147] displaced hypertrophic spleen with primary carcinoma of pedicle; Tridondani,[247] very large ectopic spleen in a pregnant woman, delivery followed by splenectomy; Power,[191] large ectopic spleen due to a blow received 3½ years prior to operation; and three instances of pelvic displacement of spleen for which splenectomy was done by Cestan,[40] Peterson,[184] and Sokoloff.[228] To these I add one successful case of my own, in which the moderately enlarged spleen was firmly adherent to the fundus of the uterus. We thus have in all a record of 60 splenectomies for idiopathically enlarged wandering spleen, with 54 recoveries and 6 deaths, a mortality of 10 per cent.

*Ectopic Hypertrophied Spleen with Twisted Pedicle.*—As has already been said torsion of the pedicle is an accident that may occur in any case of wandering spleen. This may take place slowly so as to cause a gradual enlargement of the organ. In other cases the twist occurs suddenly and gives rise to most acute symptoms similar to those caused by the twisting of the pedicle of an ovarian cyst. It is usually possible in these cases to make out the tense and tender spleen, but in other instances operation has been performed for supposed intestinal perforation or strangulation.

Splenectomy is an operation of necessity in this condition, and the results of the cases that I have been able to find since 1900 are surprisingly good,—11 cases without a death. Prior to 1890 splenectomy for wandering spleen with twisted pedicle was done 5 times with only 1 recovery and 4 deaths, and from

1890 to 1900, 11 times with 7 recoveries and 4 deaths. The 11 additional cases which I have collected include one case each by Chandelux [52]; Cocran [54]; Hunter [111]; Steinbrueck [233]; Ullmann [250]; one case by Childe [53] complicated by a large subcapsular hemorrhage; one case by Wallace [254] in a girl 12 years old; two cases in which the spleen lay on the right side of the uterus by Edge,[72] and by Webster [260] and one case by Vincent and Cabanes,[253] in which the spleen lay in the right iliac fossa.

*Malarial Hypertrophy of the Spleen.*—Malarial fever is a well-recognized cause of chronic splenic tumor. The "ague cake" occurs in individuals who are either repeatedly exposed to infection, or in those who are insufficiently treated. Such patients develop a more or less pronounced cachexia and for this reason splenectomy has been repeatedly performed in the mistaken idea (Jonnesco) that the spleen continues to be a habitat for the malarial parasites.

The chief indications which call for the removal of the malarial spleen are its increased size, increased mobility, its consequent tendency to rupture, and the danger of acute torsion of the pedicle. Spontaneous rupture is not infrequent in the Tropics, as the organ is easily lacerated by minor grades of traumatism that would not seriously affect a healthy spleen. The chief factors in producing mortality appear to be the large size of the tumor, and the presence of marked anæmia and cachexia.

In the period before 1890 splenectomy for enlarged malarial spleen was done 24 times with 9 recoveries and 15 deaths; and during the period 1890 to 1900, 64 times with 49 recoveries and 15 deaths. Since 1900 I have been able to collect 58 splenectomies by 31 operators, with 50 recoveries and 8 deaths (see bibliography), to which I add 3 successful cases of my own making 61 splenectomies with 53 recoveries and 8 deaths, a mortality of 13.1 per cent.

*Ectopic Malarial Spleen.*—The same indications for operation apply here as in the case of the idiopathically enlarged wandering spleen. Reports of the cases of splenectomy

in this condition would seem to indicate that the operation is performed at a more favorable period in the patient's illness as the mortality is exceedingly low. Prior to 1890, 11 cases are reported with no deaths, and from 1890 to 1900, 15 cases with 14 recoveries and 1 death. Since 1900 I have collected 14 additional cases without a death. Of these, 8 are reported by R. Schwarz,[219] and one each by Bargellini,[16] Carini,[42] Kelley,[128] Nuñez,[174] Potherat,[190] and Sakharov.[212]

*Ectopic Malarial Spleen with Twisted Pedicle.*—As has already been said in speaking of idiopathically enlarged spleens, torsion of the pedicle is an absolute indication for operation and removal of the spleen. Prior to 1890 this was done in two cases with 1 recovery and 1 death, and from 1890 to 1900, 3 times with 2 recoveries and 1 death. Since 1900 I have collected 7 cases without a death; 2 cases reported by R. Schwarz,[219] and one each by Bennett,[21] Coen,[55] Montanari,[165] Pozzi,[194] and Vignard.[252]

*Splenic Anæmia—Banti's Disease.*—Under the term splenic anæmia are grouped certain cases of splenic enlargement associated with anæmia. There is no history of malarial fever and the subsequent course of the disease differs from that of chronic malaria with enlarged spleen. Banti, in 1894, called attention to the frequent development of cirrhosis of the liver as the disease progresses, and the term Banti's disease is really applicable to those cases only which show the characteristic signs as he described them, viz., anæmia, splenomegaly, and hepatic cirrhosis with ascites. In splenic anæmia there is no general glandular enlargement, which serves to distinguish it from Hodgkin's disease with splenic involvement. It is differentiated at once from leukæmia by the blood picture. The usual findings in splenic anæmia are a diminution in the red cells to an average of 2,500,000 to 3,000,000 per c.mm. with a relatively greater decrease in the proportion of hæmoglobin, so as to produce the picture of a very severe chlorotic anæmia. The leucocyte count is characteristically low, usually ranging from 2000 to 3000 per c.mm. The leucocytic formula departs but slightly from the normal, although there

may be a slight increase in the relative proportion of the mononuclear elements. Abnormal blood cells,—myelocytes, nucleated red cells, etc.,—do not appear in the circulating blood.

The etiology of Banti's disease is absolutely unknown, and much careful study has failed to show whether the anæmia is secondary to some condition in the spleen or whether both the anæmia and splenic enlargement are dependent on some primary condition. As the usual course of the disease is gradually downward it has been hoped that the patient may be cured by removing the spleen. In two carefully studied cases operated upon by Harvey Cushing and J. C. Warren in 1898 and 1900 the patients are reported well and strong after 8 years and 6½ years respectively.

Prior to 1900 there are reports of 17 splenectomies in splenic anæmia with 12 recoveries and 5 deaths. These cases are cited in a paper by Torrance [215] who records one successful case of his own in 1907 and collects 18 other cases in which splenectomy was done between 1900 and 1907 with 14 recoveries and 4 deaths. These 18 cases were reported or operated upon by Harris and Herzog, Warren, Jaffe, Tschernichowski, Cushing, Mayo (2 cases), Halsted, Bevan, Gordon, Jonas, Clarke, Laspeyres, Hart, Koenig, Harris, Armstrong, and Carr. I have been able to find 25 additional cases, reported since 1900 and not mentioned in Torrance's article, with 22 recoveries and 3 deaths, viz.: Bérard [22]; Bucco [40]; Caro [45]; Carstens [47]; Davis [62]; del Castillo Ruiz [48]; Flammer [79]; Gangitano [80]; Latarget [137]; Legnani [141]; Levison [143]; Martinelli [152]; Polosson and Violet [188]; Quénu and Duval [195]; Rieppi, 2 cases [204]; Roger, 2 cases [207]; Stirling, 2 cases [234]; Tansini, 2 cases [238, 239, 240]; Thiel [241]; Thienhaus [242]; and Umber.[249] In 4 of these cases, those of Bucco, Gangitano, and the two of Tansini, the patients were in the so-called third stage of Banti's disease, and Talma's operation was done in the attempt to control the ascites. Three of these cases recovered and 1 died.

We thus have in all, up to the present writing, reports of

61 cases of splenic anæmia, or Banti's disease, treated by splenectomy with 49 recoveries and 12 deaths, a mortality of 19.5 per cent.

*Cysts of the Spleen.*—Three kinds of cysts have been found in the spleen: (1) non-parasitic cysts (serous cysts, blood cysts, and lymph cysts); (2) hydatid cysts; and (3) dermoid cysts.

There is only one reported instance of dermoid cyst of the spleen. This was reported by Andral in 1829, and was said to contain fatty matter like tallow, with hairs scattered throughout.

Hydatid cysts are the most common form of cysts of the spleen, but are only found in those countries in which hydatid disease occurs. These cysts may attain large size and are most commonly treated by incision and drainage. In other instances splenectomy has been done. Prior to 1890 there are records of 5 splenectomies with 2 recoveries and 3 deaths; from 1890 to 1900, 10 splenectomies with 9 recoveries and 1 death. Since 1900 I have found reports of 8 splenectomies with no deaths, viz., Carnabel [44]; Delore [63]; von Herczel [105]; Jordan [125]; Latarget [137]; Slavchev [227]; Tricomi [240]; and Giannettasio.[90]

Non-parasitic cysts may be unilocular or multilocular. The most common kind is the blood cyst, which results from hemorrhage either into the substance of the spleen or just beneath the capsule. A history of trauma is obtained in many cases, while in other instances the cyst probably results from a partial rupture of the spleen during the course of some acute infection, such as typhoid fever. In not a few of the recorded cases the cyst has been found in distinctly hypertrophied spleens, which, as has already been mentioned, are especially liable to injury. It is questionable whether some of these cases should really be classified as blood cysts because the condition, as described, appears to be simply a subcapsular hæmatoma. Blood cysts of long standing usually show a distinct thick capsule, and are found to contain shreds of fibrin and granular detritus.

Serous cysts are in all probability hemorrhagic in origin, and, as Moynihan says, the solid constituents of the blood are no doubt deposited laminally upon the wall of the cyst, the fluid contents becoming thereby clearer. The operative procedure in cases of serous cysts will depend on conditions as found upon opening the abdomen. Simple puncture and the withdrawal of the fluid is not only obsolete but dangerous. If the cyst is of such size that most of the spleen tissue is destroyed, splenectomy is the operation of choice, provided there are not too many dense adhesions about the organ. If, as in some reported cases, *e.g.*, Powers' case,[192] splenectomy would be either impossible or extremely hazardous, then it becomes necessary to drain the cyst, after suturing it to the abdominal wall. Occasionally the cyst can be enucleated, as in a recent case of mine, in which a cyst the size of a goose egg was shelled out from the under surface of the spleen and the raw surface of the spleen closed by two sutures threaded on blunt liver needles.

Prior to 1890 splenectomy was done 4 times for non-parasitic cysts without a death; from 1890 to 1900, 3 times with no mortality. Powers[192] writing in 1906, has collected six cases of non-parasitic cysts reported since 1900 in which splenectomy was performed with no deaths, viz., cases by Michailowsky, Routier, Dalinger, Jordan, Monnier, and Heinricius. In addition to these I have collected 6 more cases of splenectomy for this condition, in all of which recovery ensued, viz., Bacelli[13]; Bryan[38]; Gerard[80]; Israel[112]; Leonte[142]; and McMurtry.[158] This gives a total of 19 splenectomies for non-parasitic cysts of the spleen with 19 recoveries and no deaths.

*Leukæmia.*—The removal of the spleen in splenomyelogenous leukæmia is very definitely contraindicated. In the early period of splenic surgery, splenectomy was repeatedly performed in the hope of eradicating the disease. In 1894, Vulpius and Ceci collected 28 cases of splenectomy in leukæmia with 25 deaths immediately after the operation. Of the 3 cases that survived the operation one lived 13 days, another

8 months, while the third is reported as having been cured (Franzolini's case).

The total number of cases of leukæmia that were treated by splenectomy up to 1900 number 42. Of these, 4 are reported to have recovered and 38 died. Since 1900 I have found 6 additional cases, viz., Blanquinque [28]; Cetnarowski [50]; Lindner [140]; McGraw [150]; Piquand [185]; and Warren.[257] Four of these cases died very promptly after operation, while 2 cases —those of Lindner and Warren—survived. Warren's case lived about four years while the late result in Lindner's case is not known. To these I add one case of my own, in which the patient died 5 days after operation. A post-mortem examination was not obtained, and I was not able to determine the exact cause of the fatal termination as there were no evidences of either hemorrhage or peritonitis. This makes a total of 49 splenectomies in myelogenous leukæmia with 6 recoveries and 43 deaths, a mortality of 87.7 per cent.

From these results it is obvious that splenectomy is unjustifiable in leukæmia. Hemorrhage and shock are the chief factors in the mortality of this operation. In addition, our present conception of the bone marrow changes in this disease would seem to demonstrate the futility of splenectomy to stay the progress of the malady.

*Tuberculosis of the Spleen.*—Tuberculosis of the spleen does not occur as a primary affection, but nevertheless several interesting cases are on record in which a tuberculous spleen has been removed with subsequent entire recovery. These cases all presented splenic tumors and in one of them, at least, the diagnosis of tuberculous spleen was entertained because of coincident signs in the lungs. It may be said, however, that it is impossible to make a diagnosis of tuberculosis of the spleen and the condition can therefore never be treated as such.

Prior to 1890 there is a report of only 1 case of splenectomy for tuberculosis, and this resulted fatally (Burke's case). From 1890 to 1900 there are reports of 3 cases by Bland-Sutton, Lannelongue and Vitrac, and Marriott. These 3 cases all recovered, and Marriott's case, operated upon in 1891, was reported alive and well in 1906 (Moynihan). Since 1900,

I have found 6 cases of splenectomy for tuberculosis of the spleen, with 5 recoveries and 1 death. These cases were reported by Bayer,[10] Carle,[43] Cominotti,[58] Delore,[64] Franke,[82] and Grillo.[93] The case of Quénu and Baudet (1898) was not a typical splenectomy, as only a part of the spleen was removed and the lower pole drawn into the peritoneal wound and drained; suppuration continued for 4 months, and tubercle bacilli were found in the discharge. Bayer's paper has record of 9 of these cases, including that of Quénu and Baudet. Franke's case recovered from the operation but died 26 days later after leaving the hospital against his orders.

*Sarcoma of the Spleen.*—An excellent résumé of the subject of sarcoma of the spleen is to be found in the paper by Jepson and Albert[116] in which are collected all the cases up to and through 1904, including their own case in which splenectomy was done. Since that time I have found only one instance of splenectomy for sarcoma of the spleen, and that is the case reported by Willy Meyer in February, 1906.[161] This was a round-celled sarcoma and apparently not primary, as there were evidences of further metastases in the abdomen. This patient recovered from the operation and was in fair health 2 months later.

Eleven cases of splenectomy for sarcoma of the spleen are collected by Jepson and Albert. Of these 8 recovered and 3 died. One patient (Fritch-Ashe) lived 6½ years and then died of a cardiac affection. Jepson's patient was in good health 10 months after the operation. Three of the 8 cases are known to have died from recurrence of the growth.

Although the spleen seems to possess a relative immunity to secondary involvement by new growths, yet secondary sarcoma is undoubtedly more common than a primary growth. It is quite possible, however, that a sarcoma may originate in either the capsule and trabeculæ, lymphoid tissue, or endothelial cells, giving rise respectively to fibrosarcoma, lymphosarcoma, and endothelial sarcoma (Jepson). Except for the firm, solid, and usually irregular tumor, there is nothing characteristic in the symptoms, or in the blood picture, of sarcoma of the spleen.

Carcinoma of the spleen has never been recorded in any case which will bear investigation (Moynihan).

*Abscess of the Spleen.*—Abscess of the spleen is a distinctly rare condition, and is always secondary to an infective lesion either in the course of the blood stream or in immediate contiguity to the spleen. The most common cause is an infected embolus which gives rise to a septic infarct. This may occur in the course of an acute infectious disease, or follow some local suppurative lesion, especially in the portal area, such as appendicitis, pyosalpinx, etc.

Surgical treatment is always indicated in abscess of the spleen. Incision and drainage is the operation of choice, especially if the abscess is pointing, or dense adhesions are found about the spleen. In a few cases splenectomy has been done, 3 times prior to 1890, and 4 times between 1890 and 1900. All 7 of these cases recovered. Since 1900 I have found reports of 2 splenectomies for abscess with 1 recovery and 1 death, viz., Eberhart,[71] streptococcus infection, necrosis and abscess of spleen, recovery from operation, died 3 months later from pyæmia; and Karewski,[127] traumatic, necrosed spleen with subphrenic abscess, recovery.

*Miscellaneous Affections of the Spleen.*—Five splenectomies, with 4 recoveries and 1 death, have been performed since 1900 for "pseudoleukæmia." Two of these cases, DeRenzi[67] and Salvia,[213] were instances of infantile splenic pseudoleukæmia, with recoveries in each. Rochard's[205] case was probably one of splenic anæmia; Cetnarowski's[50] probably a malarial hypertrophy, while the exact nature of Erbkam's[75] case is not clear.

Wolff,[264] in 1906, reports the successful removal of the spleen in a case of infantile splenic anæmia.

Two splenectomies have been done since 1900 for benign growths, viz.: von Burckhardt[41] removed the spleen together with a growth involving the splenic ligament which proved to be a myxofibrolipoma; and Noguchi[172] extirpated the spleen together with a very large peritoneal lipoma. Both patients recovered.

Tietze [213] performed a successful splenectomy on a patient who had an echinococcus cyst of the spleen opened 3 years previously. The spleen was removed in order to cure a persistent sinus.

Winckler [203] reports a case of aneurism of the splenic artery in which he did a splenectomy. The patient recovered.

My sixth case of splenectomy may be tabulated in this group. The patient had been operated upon three years previously for an abscess of the spleen, the organ being fastened to the abdominal wall, incised and drained. She came to me with a good-sized ventral hernia in which was found a moderately large incarcerated spleen. The spleen, together with a large portion of adherent omentum, was removed, and the hernia repaired. In addition, complete hysterectomy was performed for carcinoma of the body of the uterus. The patient made a good recovery, and was reported to be in good health 2 years later.

Prior to 1900 there are records of 2 cases of benign growth of the spleen treated by splenectomy, with 1 recovery and 1 death.

### WOUNDS AND INJURIES OF THE SPLEEN.

*Rupture of the Spleen.*—Subcutaneous rupture of the spleen is not a very rare accident. The normal spleen is only apt to be damaged by crushing injuries, but an enlarged spleen is readily torn by blows, not a few cases being due to kicks from a horse, and by falls. It is surprising how trivial an injury may cause a laceration of a hypertrophied spleen. Rupture of the spleen is particularly fatal because of the very extensive hemorrhage that almost always ensues. Immediate operation is imperative and it is usually found necessary to remove the spleen. Berger,[24] in 1902, collected 67 cases of ruptured spleen treated by splenectomy with 38 recoveries and 29 deaths.

*Penetrating Wounds.*—These are caused either by gunshot or stab wounds. The spleen is very rarely the only organ injured and the prognosis depends very largely upon the extent of the traumatism. The indications are for immediate opera-

tion, but the exact method to be followed in treating the wounded spleen can only be determined after the abdomen is opened. In some cases the splenic wound can be closed by suture, or the wound may be cauterized and tamponed. If the injury is multiple, or the rent large, splenectomy is the operation of choice. Berger's statistics (loc. cit.) give 6 cases of gun-shot wound treated by splenectomy with 2 recoveries and 4 deaths, and 7 cases of stab wounds in which the spleen was extirpated with 5 recoveries and 2 deaths.

Grouping together all traumatic lesions of the spleen there are reported up to 1900, 37 cases with 20 recoveries and 17 deaths. Since 1900 I have collected 113 cases (see bibliography) with 79 recoveries and 34 deaths. Of these 113 cases, 11 were gun-shot wounds with 8 recoveries and 3 deaths, viz.: Brennflech [30]; Carr [46]; Freund [83]; Graf,[92] 2 cases; Hartmann [101]; Hotchkiss [109]; Lebreton [140]; Longo [148]; Noetzel [171] and Penkert[182]; and six were stab wounds, viz.: Bernhard [25]; Ciechomski [51]; Demons [65]; Korn [133]; Krjenkow [134]; and Moses.[166]

We thus have reported in all, up to 1908, 150 cases of splenectomy for injuries and wounds of the spleen with 99 recoveries and 51 deaths, a mortality of 34 per cent.

## SUMMARY.

As shown in the preceding table, there are herewith collected and tabulated 708 operations of splenectomy with 514 recoveries and 194 deaths, a mortality of 27.4 per cent.

In the period from 1900 to 1908 there are records of 355 splenectomies with 289 recoveries and 66 deaths, a mortality of 18.5 per cent. If the instances of removal of the spleen for traumatic affections of that organ be excluded there remain 242 splenectomies with 210 recoveries and 32 deaths, a mortality of 13.2 per cent. The well-recognized contraindication to operation in leukæmia may furthermore serve to exclude the seven cases in this series, which leaves a total of 235 splenectomies for diseases of the spleen with 208 recoveries and 27 deaths, a mortality of 11.5 per cent.